What is claimed is:

Sub B'

1. A method of manufacturing a semiconductor device comprising the steps of:

forming a crystalline semiconductor film on an insulating surface;

forming an insulating film on said semiconductor film;

introducing a dopant impurity into said semiconductor film through said insulating film by ion doping; and

heating said crystalline semiconductor film to activate said dopant impurity,

wherein a peak of a concentration profile of said dopant impurity is located in said insulating film.

Sub E1

2. A method according to claim 1 wherein said insulating film comprises silicon oxide.

3. A method according to claim 1 wherein said dopant impurity is phosphorus.

Sub E1

4. A method according to claim 1 wherein said dopant impurity is boron.

Sub C2

5. A method according to claim 1 wherein said semiconductor film comprises polycrystalline silicon.

B

6. A method according to claim 3 wherein said phosphorus is supplied by phosphine gas.

Sub E1

7. A method according to claim 4 wherein said boron is supplied by diborane gas.

8. A method according to claim 1 further comprising a step of removing said insulating film.

Sub. B2

B

9. A method according to claim 1 wherein said semiconductor device comprises active matrix devices made of thin-film transistors.

10. A method according to claim 1 wherein said semiconductor device comprises a shift resistor circuits made of thin-film transistors.

Sub E1

11. A method according to claim 1 further comprising a step of irradiating a laser light to said crystalline semiconductor film.

12. A method of manufacturing a semiconductor device comprising the steps of:

forming a crystalline semiconductor film on an insulating substrate;

forming an insulating film on said semiconductor film;

introducing a dopant impurity into said semiconductor film through said insulating film by ion doping; and

irradiating a laser light to said semiconductor film to activate said dopant impurity,

wherein a peak of a concentration profile of said dopant impurity is located in said insulating surface.

13. A method according to claim 12 wherein said insulating film comprises silicon oxide.

14. A method according to claim 12 wherein said dopant impurity is phosphorus.

15. A method according to claim 12 wherein said dopant impurity is boron.

16. A method according to claim 12 wherein said semiconductor film comprises polycrystalline silicon.

17. A method according to claim 14 wherein said phosphorus is supplied by phosphine gas.

18. A method according to claim 15 wherein said boron is supplied by diborane gas.

19. A method according to claim 12 further comprising a step of removing said insulating film.

20. A method according to claim 12 wherein said semiconductor device comprises active matrix devices made of thin-film transistors.

Sub B4

21. A method according to claim 12 wherein said semiconductor device comprises a shift resistor circuits made of thin-film transistors.

22. A method of manufacturing a semiconductor device comprising the steps of:

forming a crystalline semiconductor film on an insulating surface;

forming an insulating film on said semiconductor film;

introducing a dopant impurity into said semiconductor film through said insulating film by ion doping; and

Sub B4 cont'd.

heating said crystalline semiconductor film to activate said dopant impurity,

wherein a peak of a concentration profile of said dopant impurity is located above said insulating film.

Sub E1

23. A method according to claim 22 wherein said insulating film comprises silicon oxide.

24. A method according to claim 22 wherein said dopant impurity is phosphorus.

Sub E1

25. A method according to claim 22 wherein said dopant impurity is boron.

Sub C4

26. A method according to claim 22 wherein said semiconductor film comprises polycrystalline silicon.

27. A method according to claim 24 wherein said phosphorus is supplied by phosphine gas.

Sub E1

28. A method according to claim 25 wherein said boron is supplied by diborane gas.

Sub E1 29. A method according to claim 22 further comprising a step of removing said insulating film.

30. A method according to claim 22 wherein said semiconductor device comprises active matrix devices made of thin-film transistors.

Sub. B5

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31. A method according to claim 22 wherein said semiconductor device comprises a shift resistor circuits made of thin-film transistors.

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Sub E1 32. A method according to claim 22 further comprising a step of irradiating a laser light to said crystalline semiconductor film.

33. A method of manufacturing a semiconductor device comprising the steps of:

Sub. B6

forming a crystalline semiconductor film on an insulating substrate;

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forming an insulating film on said semiconductor film;

introducing a dopant impurity into said semiconductor film through said insulating film by ion doping; and

irradiating a laser light to said semiconductor film to activate said dopant impurity,

Sub. 7 B6 con'd. wherein a peak of a concentration profile of said dopant impurity is located above said insulating surface.

34. A method according to claim 33 wherein said insulating film comprises silicon oxide.

35. A method according to claim 33 wherein said dopant impurity is phosphorus.

36. A method according to claim 33 wherein said dopant impurity is boron.

37. A method according to claim 33 wherein said semiconductor film is a polycrystalline semiconductor film.

38. A method according to claim 35 wherein said phosphorus is supplied by phosphine gas.

39. A method according to claim 36 wherein said boron is supplied by diborane gas.

40. A method according to claim 33 further comprising a step of removing said insulating film.

41. A method according to claim 33 wherein said semiconductor device comprises active matrix devices made of thin-film transistors.

sub. B7

42. A method according to claim 33 wherein said semiconductor device comprises a shift resistor circuits made of thin-film transistors.

43. A method of manufacturing a semiconductor device comprising the steps of:

B

forming a crystalline semiconductor film having a portion to become a channel region on an insulating surface;

forming an insulating film on said semiconductor film;

introducing a dopant impurity into at least said portion through said insulating film by ion doping; and

heating said crystalline semiconductor film to activate said dopant impurity,

wherein a peak of a concentration profile of said dopant impurity is located in said insulating film.

44. A method according to claim 43 wherein said semiconductor device comprises active matrix devices made of thin-film transistors.

sub. B7 con'd.

45. A method according to claim 43 wherein said semiconductor device comprises a shift resistor circuits made of thin-film transistors.

46. A method according to claim 43 wherein said concentration is within a range from 5 x 10^{15} atoms/cm^3 to 5 x 10^{17} atoms/cm^3.

Sub E1

47. A method according to claim 43 further comprising a step of irradiating a laser light to said crystalline semiconductor film.

48. A method of manufacturing a semiconductor device comprising the steps of:

sub. B8

forming a crystalline semiconductor film having a portion to become a channel region on an insulating surface;

forming an insulating film on said semiconductor film;

introducing a dopant impurity into at least said portion through said insulating film by ion doping; and

irradiating a laser light to said semiconductor film to activate said dopant impurity,

wherein a peak of a concentration profile of said dopant impurity is located in said insulating surface.

Sub. B8 cont'd.

49. A method according to claim 48 wherein said semiconductor device comprises active matrix devices made of thin-film transistors.

50. A method according to claim 48 wherein said semiconductor device comprises a shift resistor circuits made of thin-film transistors.

51. A method according to claim 48 wherein said concentration is within a range from 5 x 10^{15} atoms/cm^3 to 5 x 10^{17} atoms/cm^3.

Sub. B9

52. A method of manufacturing a semiconductor device comprising the steps of:

forming a crystalline semiconductor film having a portion to become a channel region on an insulating surface;

forming an insulating film on said semiconductor film;

introducing a dopant impurity into at least said portion through said insulating film by ion doping; and

heating said crystalline semiconductor film to activate said dopant impurity,

wherein a peak of a concentration profile of said dopant impurity is located above said insulating film.

Sub. B9

53. A method according to claim 52 wherein said semiconductor device comprises active matrix devices made of thin-film transistors.

54. A method according to claim 52 wherein said semiconductor device comprises a shift resistor circuits made of thin-film transistors.

Sub E1

55. A method according to claim 52 wherein said concentration is within a range from 5×10^{15} atoms/cm^3 to 5×10^{17} atoms/cm^3.

Sub. B10

56. A method according to claim further comprising a step of irradiating a laser light to said crystalline semiconductor film.

57. A method of manufacturing a semiconductor device comprising the steps of:

forming a crystalline semiconductor film having a portion to become a channel region on an insulating surface;

forming an insulating film on said semiconductor film;

introducing a dopant impurity into at least said portion through said insulating film by ion doping; and

Sub. B10 cont'd

irradiating a laser light to said semiconductor film to activate said dopant impurity,

wherein a peak of a concentration profile of said dopant impurity is located above said insulating surface.

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58. A method according to claim 57 wherein said semiconductor device comprises active matrix devices made of thin-film transistors.

59. A method according to claim 57 wherein said semiconductor device comprises a shift resistor circuits made of thin-film transistors.

60. A method according to claim 57 wherein said concentration is within a range from 5 x 10^{15} atoms/cm^3 to 5 x 10^{17} atoms/cm^3.

Add B11

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Add C7

ADD D3